Market
Analysis
Program
(MAP)

# Industry Sector Markets 1991-1996

# Utilities Sector

INPUT®

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# INDUSTRY SECTOR MARKETS 1991-1996

# UTILITIES SECTOR

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# Introduction

# I

# Introduction

## A

## Purpose and Methodology

### 1. Purpose

The purpose of this report is to provide the 1991 INPUT forecast for the utilities industry market, with commentary on recent market and competitive issues. There are five basic objectives of this report.

- Introduce the reader to the utilities industry's structure and demographics
- Identify business trends and issues that are driving the use of information services within the utilities industry
- Discuss how the utilities industry uses information systems, and the issues facing the information systems organizations within this industry
- Discuss the information services market within the utilities industry, including market sizing and the factors driving market demand for each delivery mode
- Discuss the competitive environment, and profile the leading information services vendors in the utilities industry

### 2. Methodology

Much of the data on which this report is based were gathered during 1991 as part of INPUT's ongoing market analysis program. Trends, market size, and growth rates are based primarily upon in-depth interviews with users within the utilities industry and the information services vendors serving this industry. INPUT maintains ongoing relationships with, and a data base of, all users and vendors that it interviews. Interviewees for the research portion of this report were selected from this data base of contacts.

In addition, extensive use was made of INPUT's corporate library, which contains several on-line periodical data bases, continually updated files on over 3,000 information services vendors, and the most up-to-date U.S. Department of Commerce publications on industry statistics.

It must be noted that vendors may be unwilling to provide detailed revenue breakouts by delivery mode or industry. Also, vendors often use different categories of industries, or view services as falling into different delivery modes from those used by INPUT. Thus INPUT must estimate revenues by these categories on a best-estimate basis. The delivery mode and individual segment forecasts should be viewed as indicators of general patterns and trends rather than specific, detailed estimates for individual years.

When the information is provided from vendors as requested, at times it is provided under an agreement of confidentiality. Therefore, vendor rankings based on these revenue figures should be considered indicative rather than definitive, and the revenues themselves should be viewed as approximations only.

## B
## Industry Structure

INPUT analyzes utilities as a vertical market that includes the electric, gas, and water/sewage/waste disposal segments. Electric utilities can be investor-owned, cooperative, municipality-owned, federally owned, or state projects/power districts. Gas utilities consist of pipelines (transmission) and distribution (local) companies. Water/sewage/waste disposal utilities can be publicly or municipally owned, or privately owned.

The SIC (Standard Industry Classification) for this market is 49 (491-497). Telephone and cable television services are discussed as part of the telecommunications vertical market (SIC 48).

The number of utilities in the U.S. in 1991 is shown in Exhibit I-1. These are U.S. numbers with the exception of gas utilities, where the numbers include Canada. As a rule of thumb, the Canadian market represents about 10% of the U. S. market. The number of utility employees as of 1991 is estimated in Exhibit I-2. Exhibit I-3 describes the percentage of employees in each of six end-user categories.

EXHIBIT I-1

## Number of Utilities in U.S. by Type 1991

| Type of Utility | Number of Utilities |
|---|---|
| Electric* | |
| - Investor-owned | 203 |
| - Cooperatives | 934 |
| - Municipalities | 1,810 |
| - Federal | 37 |
| - Other Government (state, county, power districts, irrigation districts | 162 |
| Total - Electric utilities | 3,151 |
| Gas** | |
| - Transmission (investor-owned pipeline) | 193 |
| - Distribution (investor-owned utilities) | 317 |
| - Combinations (both pipeline and distribution) | 109 |
| - Municipalities | 757 |
| Total - Gas utilities | 1,400 |
| Water*** | |
| - Public/municipalities | 24,200 |
| - Private ownership | 24,500 |
| Total - Water utilities | 48,700 |
| Sewage and waste disposal**** | |
| - Sewage services | 5,100 |
| - Combined services | 500 |
| Total - Sewage and waste disposal utilities | 5,600 |
| Grand Total | 58,827 |

* Source: Electrical World Directory - 1991
** Source: Brown's Directory (U.S. and Canada)
*** Source: American Water Works Association
**** Source: Sales and Marketing Management Magazine

EXHIBIT I-2

## Number of Employees by Type of Utility 1991

| Utility | Total Employees |
|---|---|
| Electric | |
| Investor-owned | 514,000 |
| Other | 160,000 |
| Gas | 203,300 |
| Water | 97,000 |
| Sanitary Services | 100,000 |
| Total | 1,074,300 |

EXHIBIT I-3

## End-User Population by Category

| Category | Percent |
|---|---|
| Production (Generation, transmission, distribution) | 54 |
| Commercial (customer service) | 21 |
| Engineering | 10 |
| Management | 10 |
| Business professionals (Legal, communications, etc.) | 4 |
| Data processing professionals | 1 |
| Total | 100 |

The overall utility market is dominated by the large investor-owned electric and gas utilities. About 200 of these utilities represent the mainframe market.

Smaller investor-owned, rural electric cooperatives and municipalities represent the next tier, which is largely a minicomputer market. At its lowest end (utilities with fewer than 5,000 customers), it is a microcomputer market.

Much of the municipal market for utilities is invisible. An estimated 90% of the municipal utility application function runs on systems shared with other services—e.g., police, fire, and schools. The utility role is relatively minor. In this market, IS expenditures are made in the context of all municipal services and are not considered in this report. The 10% that basically have dedicated utility systems are included.

Lastly, the water/waste disposal industry consists of small utilities that are often part of municipal government. More than half of the approximately 50,000 water companies service populations of less than 500 and as few as 125 customers per billing interval.

This group is essentially a microcomputer market. The average water utility customer pays $200 annually for service.

These are, of course, generalizations. Large utilities use minis and micros as well as mainframes. Some municipalities—e.g., the Los Angeles Department of Water & Power—are quite large. Similarly, the federal government owns the formidable Tennessee Valley Authority.

Additionally, the traditional view of the power of mainframes versus minis versus. micros is being tested as a few large utilities begin to implement major applications previously considered exclusively mainframe applications on minis and even micro workstations.

## C
## Organizaton and Contents of Report

The remainder of this report is organized as described below:

- Chapter II—Trends, Issues, and Events—provides background information on the business issues and trends that are driving the use of information services within the utilities industry.

- Chapter III—Information Systems Environment—provides an overview of the basic business processes in the utilities industry and their supporting information systems applications.

- Chapter IV—Information Services Market—provides the total market forecasts and the forecast by delivery mode. The delivery modes included are:

  - Processing services
  - Network services
  - Applications software products
  - Turnkey systems
  - Systems integration
  - Systems operations
  - Professional services

- Chapter V—Competitive Environment—identifies key competitive issues in providing information services to the utilities industry and profiles the leading information services vendors.

- Chapter VI—Conclusions and Recommendations—reviews the trends and opportunities described in this report and provides recommendations for vendors and users.

# II

# Trends, Issues, and Events

# II

# Trends, Issues, and Events

## A
## Introduction

### 1. Homogeneity/Heterogeneity

There is a tendency to lump utilities into a generalized block, and to think of all utilities as the same. Exhibit II-1 lists a few utility industry characteristics.

EXHIBIT II-1

**Utility Industry Characteristics**

| Similarities | Differences |
|---|---|
| Regulated | Fuel type |
| Customer mix | Area demographics |
| Service orientation | Climate |

- The similarities include:

  - Utilities are regulated.
  - Utilities service industrial, commercial, and residential customers.
  - Utilities are service oriented and provide a product very fundamental to customers.

- At the same time, and increasingly so in recent years, utilities are pursuing strategies unique to their circumstances. First, of course, are the fundamental differences among the different types: gas, electric, water, waste. But within each of these classifications, sharp differences exist:

  - Fuel—the nuclear utility versus coal-fired
  - Geography—the population growth of Florida
  - Seasonal demand—winter in the Midwest

And despite the similarity of regulation, different regulators are involved in each state—sometimes elected, sometimes appointed, sometimes liberal, sometimes conservative. The influence of regulatory authorities on utility actions is difficult to underestimate.

There are dozens of varying influences that render no two utilities alike. As a result, successful suppliers to utilities carefully consider individual characteristics in formulating application solutions.

## 2. Basic Functions

The primary functions of a utility are:

- Generation/production
- Transmission/pipelines
- Distribution
- General management

For the most part, utilities are vertical organizations that produce a product and deliver it to the customer.

- In electric utilities, operations normally involve the generation of power, transmission over long distances, and distribution to customers within the service territory.

- The gas industry is not as vertical. Gas production is frequently the role of the oil industry, which may also control the pipeline. The true utility aspect is the distribution system.

- In water utilities, there is no production step per se, although water treatment, which can be viewed as a type of production, can occur at many steps in the process.

- In the waste disposal industry it is said that the basic operation is distribution in reverse.

In all utilities, there are general management activities—e.g., billing, receivables, materials, legal, etc. These vary in scope primarily by the size of the utility, but a utility is not as paper-intensive an organization as is a bank or insurance company. Much of the paper is related to utilities' status as a regulated monopoly.

### a. Monopoly

Most utilities are regulated monopolies, which means that they are not free to set their own rates. Rather, rates must be approved by the state public utility commission (PUC) or a similar regulatory body. In assuring that rates are set fairly, PUCs often assess the prudence of a utility's management decisions, including those involving information systems.

### b. Obligation to Serve

In return for monopoly status, utilities accept an obligation to serve, which means that they will provide their services to all in their service territory. In recent years, with the emergence of independent power producers, co-generators, and open access in the gas and, to some extent, the electric utility industries, utility enthusiasm for service has dampened. Nevertheless, PUCs insist and the customer service orientation of utilities continues, albeit not as strongly as in the past.

### c. Rate of Return

The assets of a utility comprise a rate base on which the PUC allows the utility to earn a reasonable rate of return. In some cases, hardware and software may be capitalized and considered part of the rate base. There is serious question as to whether capitalization (rate-basing) will continue as a motivator of utility decisions throughout the 1990s.

## B
## Trends

### 1. Supply and Demand

The obligation to serve noted above implies that a utility must provide service not only to all in its service territory but at whatever amount required. In the electric, gas, and water utility industry, there is no such thing as a busy signal. As a result, utilities carefully plan to match future demand with an adequate supply and allow for many variables, including weather on the demand side and outages on the supply.

Most current estimates indicate an annual growth of 2.5% in electric demand throughout the 1990s. Will enough generation capacity be in place to meet this demand? At a 2.5% growth rate, the U. S. will require 270 new large coal or nuclear plants by 2010—and little is being planned by utilities to address this need. Large plants may take as much as ten years to become operational.

Gas demand has been relatively flat in recent years, but there is an expectation that it will accelerate as it is used more for generation of electricity as well as vehicle fleets. Interestingly, gas supply fluctuates with demand. Increasing demand provides increased incentive to produce more gas.

## 2. Regulatory Environment

### a. Climate of Deregulation

Utilities have followed the deregulation path of the airline and telephone industries. Basically, the gas pipeline industry has been deregulated. The trend begun in the Reagan administration continues as the Federal Energy Regulatory Commission (FERC) moves toward open access to electric transmission.

At the distribution level, as in the telephone industry, deregulation is more difficult to accomplish. This is essentially the area of the natural monopoly suggested by the poor economics associated with side-by-side telephone or electric lines—or gas, water, or sewer pipes. At the distribution level, it is more logical to look for "reregulation" rather than deregulation, implying tightening rather than loosening of state government oversight.

In February, 1991, the Department of Energy released the long-awaited first edition of a National Energy Strategy (NES). Its goals seek to increase conservation, diversify the fuel mix, promote new technology and lower prices—all while achieving environmental balance. The document met with the expected mixed reviews. In the area of regulation, however, in the words of one commentator: "There is one overriding theme of the NES—less regulation is preferable to more."

### b. Consumerism and the PUCs

Although technically representing consumer and utility interests, most PUCs (many of which are elective) tend to side with consumers' short-term interests. Utilities try to maintain positive public relations to help assure a cooperative PUC and thus spend a great deal of executive time with the PUC.

### c. Bureaucratic Implications

The regulatory fishbowl in which utilities live engenders an unusually conservative philosophy in most utilities. The prudence of utility decisions is always subject to question by politically influenced second-guessers. Rate cases are supported by immense paperwork, and the number of rate cases began to increase in 1991 after a steady decline throughout the 1980s. The Nuclear Regulatory Authority's paper requirements have been overwhelming since the Three Mile Island accident in 1979.

### 3. Increasing Competition

The monopolistic nature of utilities suggests the absence of competition, and utilities, with their conservative approach to business, can hardly be considered cutthroat. However, in recent years it has become increasingly apparent that the ho-hum style of many utilities has given way to an era of more intense competition.

#### a. Gas versus Electric

Competition among different fuel sources is hardly new. The basic square-off has always been gas versus electricity. This competition is normally limited to industrial and heating/air conditioning markets. Unconstrained by the contradictory forces of marketing versus conservation that afflict many electric utilities, gas companies have always been the more aggressive marketers.

#### b. IPP/Cogenerators

Encouraged by federal regulators, independent power producers and cogenerators offer new dimensions to competition for utilities. Both of these entrants have a tendency to use gas as fuel for their generators. The result is a ratchet effect between electric and gas rates.

For example, when Aetna Insurance installed a 30-megawatt plant in Hartford, Northeast Utilities lost 30 megawatts of load (and revenue). Northwest Utilities' fixed costs then were spread over remaining customers and produced an upward pressure on rates. At the same time, Connecticut Natural Gas gained a major new customer that enabled this utility to spread fixed costs more broadly and produce a downward rate pressure. In theory, the spread between electric and gas rate hikes causes more defections from the electric utility and the cycle continues.

#### c. Resurrection of Marketing

After the oil crisis of 1973, marketing went out of fashion for electric utilities. Marketing departments shrank and, renamed, refocused on conservation. The theme was: let me help you not use my product. Contradictory as this seems, conservation continues to be preached by many electric utilities, beholden as they are to the PUCs. Some states have encouraged conservation by allowing utilities to treat related costs as though they were an investment in plant. However, as larger utility customers discover that there are alternatives to the local utility, utilities have reacted by reintroducing true marketing into their lexicons and organizations.

## 4. Cost Containment

To deal with a competitive world, utilities have fallen in line with much of corporate America in focusing on the cost side of the equation. For many years, utilities were looked on as a cost-plus business. Indeed, that is basically the nature of the regulatory compact that traded monopoly status for the obligation to serve.

### a. Low-Cost Supplier

The phrase "low-cost supplier" is frequently heard in utility boardrooms today. It suggests that the days of cost-plus are history and the modern utility must adopt more aggressive management approaches to deal with a new era. In many utilities, more aggressive approaches began at the top where, more frequently, outsiders (some with telephone backgrounds) are assuming management responsibility.

### b. Downsizing/Rightsizing

As utilities assume a lean and mean stance, they have taken a knife to the fat that gathered during less-contentious times. Most utilities have already been through at least one painful downsizing exercise. There is little argument that the industry was ripe for downsizing and, indeed, the term *rightsizing* has been used to describe the process.

### c. Implementation—Top-Down versus Bottom-Up

Downsizing has been implemented in utilities under a variety of philosophies. In general, utilities have been rather paternalistic in their approaches, being careful to consider the morale implications of serious layoffs. Many utilities employed consulting firms for advice. Some cut percentages across the board; others did a bottom-up justification study and pruned where needed. As in other industries, those that left were not always the fat. In some cases they were the muscle. A certain measure of loyalty has been lost, but utilities are adapting to leaner, meaner times.

### d. Organization—Strategic Business Units

Another approach to gaining a competitive edge has been organizational. Some utilities have restructured themselves into strategic business units to increase accountability of senior executives. Usually, this restructuring is done along the lines of generation, transmission, and distribution. The result is not only accountability but the flexibility to separate these functions entirely should the business/regulatory climate so dictate.

# C
# Issues and Events

## 1. Diversification/Bankruptcy/Merger

### a. Diversification

During the 1980s many utilities found themselves with excess cash generated by rates that had finally caught up with the regulatory lag of the 1970s. Constrained as they are to a rate of return determined by the PUC, utility management attempted to expand their horizons by entering into diversified businesses.

For some, this expansion consisted merely of dabbling in fields related to the core utility business. Others pursued related endeavors more vigorously. Some entered entirely different businesses, such as savings and loans and insurance. Few efforts at diversification prospered. With some exceptions, utility managements have now decided to "stick to the knitting."

Rare as they were, some successes were recorded among diversified utilities:

- PacifiCorp, a diversified electric utility company with 58% of its $3.9 billion 1990 revenue from utility operations, earned $170 million in its two nonelectric core businesses, NERCO (mining and resource development) and Pacific Telecom (one of the nation's largest non-Bell telephone companies).

### b. Bankruptcy

The never-can-happen happened. A utility went bankrupt. Saddled with immense debt caused by cost overruns at the Seabrook Nuclear plant, Public Service of New Hampshire went belly-up in January, 1988.

In August, 1991, FERC approved a merger which will combine New Hampshire's largest utility (387,000 customers) with New England's largest, Northeast Utilities (1,250,000 customers) In that same month, the Columbia Gas System filed for Chapter 11. The company had long-term natural gas contracts paying an average of $2.70 per 1,000 cubic feet; the average on-the-spot market was $1.20.

### c. Merger

Iowa Electric Light and Power merged with Iowa Southern and rumors of additional merger activity in Iowa were rife.

The $2.8 billion merger of San Diego Gas & Electric into Southern California Edison, which would create the nation's largest electric utility, was blocked by the California PUC.

**2. Environment**

Environmental issues are having a significant impact on utilities for a variety of reasons, including Bush administration encouragement; the revelation of environmental damage in Eastern Europe, and concerns over broad, long-term issues such as the greenhouse effect. Examples reported in the press include:

- The 1990 Clean Air Act transformed the 20-year-old original law from a path-breaking but narrow statute into an ambitious plan to cut contamination from every sizable source of air pollution in the nation. The largest economic incentives are in a provision on acid rain. The provision sets the overall annual level of emissions of sulfur dioxide from power plants at 8.9 million tons by the year 2000. That level is less than half the current emissions. The measure sets a specific emissions limit on 111 utilities in 22 states.

- Cutting pollutants in coal-burning power plants that cause acid rain will cost from $5 billion to $7 billion a year. Consumers in midwestern states will absorb most of that burden.

- Regulation of an additional 24 drinking-water contaminants has been proposed by EPA. The added controls will require 80,000 public water systems to meet the new standards and to monitor for the contaminants. EPA estimated that 2,300 systems will have to treat their water for excess levels of the 24 contaminants, with 1,100 systems, most of them in the west and midwest, finding unacceptably high levels of sulfate, which EPA said can cause acute health effects.

- A $1.1 billion sewage treatment plant along the Harlem River in New York was the source of numerous complaints regarding severe odors—not an unusual occurrence in the waste treatment industry. But, because of the scale of the project, the costs to remedy the situation were assessed as astronomical, not to mention the impact on a $130 million park being built atop the plant.

- The transportation market for natural gas, particularly in fleet vehicle applications, is already enjoying a boost from the Clean Air Act amendments because of the fuel's clean-burning characteristics. Similarly, interest in battery-driven autos is on the increase.

Ian Lisk, Contributing Editor of *Water & Waste Digest*, commented: "With more EPA regulations being finalized and the public apparently interested, there is a resurgent interest in pollution control, especially on the disposal of all kinds of solid and semisolid wastes. The next decade promises to be an environmentally active one."

Forty-four thousand tons of used fuel from commercial nuclear plants must be disposed of by the year 2000. The federal government has proposed Yucca Mountain, Nevada, but the opposition cites the potential effects of earthquakes, volcanic activity and changes in the water table as major concerns. The issue remains unresolved.

Energy Secretary James D. Watkins believes that reducing U.S. vulnerability to a volatile oil market "can most likely be achieved by . . . greater fuel switching, especially to plentiful and more geographically dispersed natural gas . . . ."

### 3. Fuels

#### a. Nuclear

The Three-Mile Island accident triggered intense focus on the safety of U.S. nuclear plants. The result was a massive increase in Nuclear Regulatory Commission regulations that impacted existing nuclear plants and caused the cancellation of all orders for new plants. No new nuclear plants have been ordered since 1979.

The result of these regulations has been to dramatically increase the cost of operating nuclear plants. Indeed, although the economic justification for a nuclear plant was to have been its cheap fuel, the staffing requirements at U.S. nuclear plants cause enough expense to more than offset the fuel savings. At one plant, the original plan called for an overall staffing level now employed for plant security alone. As a result, independent of the astronomical capital costs of bringing a nuclear plant on-line, the operations and maintenance expenses are higher than a comparable-capacity coal plant, a bitter disappointment for those who bet on the promise of nuclear power.

#### b. Gas

The advantages of gas suggest it is be the preferred fuel for the 1990s. But, because gas heats 56% of U.S. homes, distribution profits can suffer dramatically in unusually warm winters.

#### c. Other Fossil

The natural gas industry has contended that greater use of its fuel could reduce such (oil) dependence and its dangers and help achieve a cleaner environment in the bargain. Shortly after the Persian Gulf crisis erupted in 1990, George C. Lawrence, then President of the AGA, said, "The U.S. could immediately offset 160,000 barrels per day of imported oil with increased natural gas use, moving up to 480,000 within a year. This alone accounts for nearly two-thirds of recent U.S. imports from Iraq and Kuwait."

On the coal side, the effects of the Clean Air Act were viewed by some as making it difficult, and in some regions impossible, to increase the electrical output of coal-fired power plants to meet increasing demand.

# III

# Information Systems Environment

# III

# Information Systems Environment

## A
## Overview

### 1. Evolution

As illustrated in Exhibit III-1, the utility application portfolio can be divided into three major segments: commercial, engineering, and operations. Frequently, the formal information systems organization has responsibility for only the commercial applications. Engineering and operations applications are most often the responsibility of the respective end-user departments and are processed outside of the information systems organization's corporate data center.

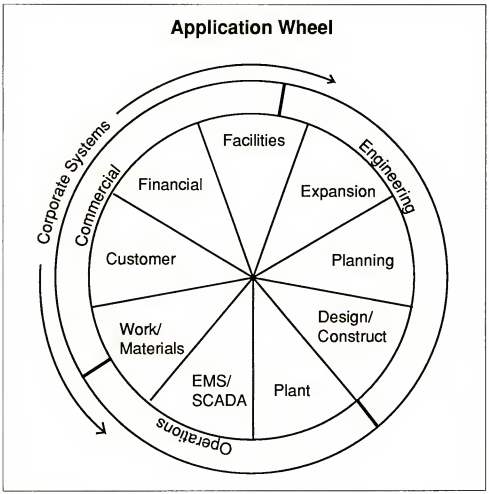
This chapter will describe each of the major applications in all three of these categories. The three segments of utility information systems evolved from different beginnings in utilities.

- The commercial applications, largely accounting related, derived from early punch-card accounting machines used to do billing. Punch-card bills were the norm in the 1940s and 1950s, but have generally been displaced by statement bills today.

- Engineering applications derived from analog computers used to model the network. With the advent of digital systems and particularly the popularity of the minicomputer in the 1970s, these engineering applications were replaced, but responsibility continued to be held by the engineering organization.

- The operations function lives in a real-time world that is perceived as totally distinct from commercial and engineering (although that is clearly arguable). Computerized SCADA (supervisory control and data acquisition) systems, which are the basic component of today's EMSs (energy management systems), were developed in the 1960s when the supervisory control systems—operated by individual switches and push-buttons from consoles and wall boards—were first replaced by systems with digital computer-based master stations.

EXHIBIT III-1




## 2. Centralization

Given its accounting heritage and the state of technology at the time, it was natural for the commercial applications to be processed on a centralized basis on mainframe systems. The industry evolved with amazing consistency in this regard.

One major driver of this consistency was the development of CICS (Customer Information Control System) as the premier mainframe data base/data communication (DB/DC) enabler of the 1960s and 1970s. In developing CICS, IBM involved several utilities. The program product was rapidly adopted by 90% of the larger utilities in the U.S. It was a serendipitous surprise for IBM when CICS proved to be so successful outside of utilities.

Another factor influencing the centralization of information systems in utilities is that utilities are by definition geographically constrained—i.e., to their service territory. As a result, communications costs and other benefits associated with a more decentralized approach that have a bearing on other, more national, industries are not a major consideration for utilities.

There are rumblings indicative of a potential shift in utilities' centralized view. Readers are referred to the description of BC Hydro's efforts below, under Customer Support System.

### 3. Corporate Systems versus Engineering/Operations

In most utilities, in the 1980s there evolved a closer relationship between engineering computing and the information systems organization. This closer relationship was a logical outgrowth of information systems' reaching out to end users under the organizational and philosophical banner of the Information Center. But the lines of separation between operations and information systems, with some significant exceptions, generally continue to the present.

The power plant has been similar to the operations side from both an engineering and an operations standpoint. With few exceptions, power plants are not built by the utilities themselves but rather by contractors. Typically, there is tremendous pressure to get the plant into operation so that its costs can be put into the rate base and the utility can earn on them. In this environment, little focus is placed on the niceties of the information systems within the plant. The systems are a combination of commercial, engineering, and operations applications.

Unlike other utility organizations, in a power plant the superintendent or manager is a czar. His or her job is to keep that plant in operation; each day out of production sometimes costs into the millions. The manager is not inclined to be beholden to information systems for support systems. Most plant systems are not systems at all, but rather a series of unrelated subsystems or "islands of information," as some refer to them.

With the advent of the 1990s we are beginning to see the wholesale integration of utility information systems—not only of the commercial systems managed by information systems, but also of the engineering and operations applications that are today outside of corporate systems' jurisdiction. The reason for this is that competitive utilities can ill afford not to capitalize on their information resources. One utility executive likens the situation to a nervous system with two brains—it would work, but not very well. The analogy is particularly apt in the light of increasing skittishness among utility executives as competitive pressures continue to increase.

# B
# Applications

## 1. Customer Support System (CSS)

The backbone system of the utility is the Customer Support System, "where it all began." As noted earlier, the first computer systems in utilities focused on accounting applications.

The customer accounting job in a utility is a big one. These systems were later extended from batch accounting to on-line customer inquiry and related subapplications. The modern CSS is the key information system of the utility and includes order processing, meter reading, billing, credit and collection, adjustments, cash, and customer information. Larger electric and gas utilities are highly complex but fairly similar in function. They tend to want solutions tailored to their unique situations. Smaller utilities such as water, cooperatives, and municipals are much simpler, making this segment more amenable to packaged solutions.

In the larger utilities, the most important characteristic of a CSS is its age. Most of these systems were developed in the early 1970s and are extremely difficult to maintain. The result has been a peak of activity in rewriting these systems. The cost of rewrites has soared, with one estimated in excess of $100 million. Almost without exception, these newly started rewrites are on an S/370 architecture using DB2 as the DBMS. Cooperative processing has been considered in some and is the only recognition of decentralization shown by the industry.

The eyes of the industry have been turned to the development of a replacement CSS at BC Hydro in Vancouver. This 1.2 million-customer utility has chosen to decentralize its Customer System into nine regions each supporting its service area on an IBM AS/400 using software packaged and upgraded by Daffron Associates, Bowling Green, MO. There are many issues attendant on this type of decentralization, including the efficiencies of billing (the factory processes), the handling of an increasingly mobile customer set and the ability to "mass (consolidated) bill" enterprises with multiple locations. BC Hydro, largely through its subsidiary, Westech, has chosen to enter untried waters in the interest of personalizing its customer support, as well as containing IS costs. The entire project is sized at $15 million in direct costs, appreciably below what a typical mainframe solution would cost. Roll-out will begin in 1992 when the 120,000 accounts in the Victoria region become operational.

The CSS area includes meter reading. For well over twenty years, utilities have piloted automatic meter reading (AMR) over telephone lines, using RF readouts, even digitized pulsing of a power line. Few of these pilots have gone far in competing with the overall economics of the meter reader.

- It costs $6-$7 per year to read a meter. In the 1980s, the meter reader was armed with a hand-held computer that simplified the task and introduced new efficiencies. The market for hand-held devices was quickly saturated for larger utilities. Today the market for hand-held devices is in the cooperatives and municipals.

- Often AMR must be augmented by additional functionality in order to prove economical. The major candidate for addition is load management, but two-way communication links could offer many interesting variations, not the least of which would be spot-pricing of energy at the residential level.

- An AWWA Research Foundation project found that there is increasing interest in AMR among water utilities. Four hundred and fifty thousand water meters are currently scheduled for conversion to AMR and AMR trials by utilities responsible for 4.2 million meters are under way. The number of AMR vendors exceeds 50 with a dozen entering the market in the last year.

### 2. Marketing Support Systems

Many utilities view marketing support systems (MSSs) as part of the customer support system. One fundamental difference is that a customer system usually follows customers only, whereas an MSS also follows prospects. This is not a subtle distinction to a marketer. Of course, an MSS uses extracts from the customer data base for market analysis. This need not be totally current data (as maintained by the CSS). Rather, it is a snapshot at a point in time, perhaps monthly, and it is frequently complemented by related demographic data from external sources. The architecture is often relational to allow ease of access for unanticipated analyses.

Beyond the analysis aspects of an MSS, a variety of other tools are used. These include tracking and account planning systems and mailing lists. Most important are forecasting tools that enable the marketing organization to evaluate various rates, since price is often the only way to differentiate products.

### 3. Financial Systems

Utility accounting practices have many quirks that distinguish them from other industries. These include the ramifications of regulation and its associated reporting requirements, as well as creative devices used to reflect the capital-intensive nature of the industry.

- An example of the former is the use of FERC codes for reporting purposes despite their inapplicability to running the actual business.

- An example of the latter is the Allowance for Funds Used During Construction (AFUDC), which somehow allows a utility to claim revenue for funds used to finance construction work in progress.

In addition, the bookkeeping requirements of utilities covered under the Public Utility Holding Company Act of 1935 are quite different from the requirements of companies not so fortunate. A major objective of many utilities is to introduce true-cost accounting techniques into financial systems to enable the utility to price its products for profit on a situation-by-situation basis. Suffice it to say that utility financial systems are highly complex and a critical part of utility operations.

### 4. Transmission and Distribution (T&D)—Work/Materials Management

Work management and complementary materials management systems are the cornerstones of utility operations in the field. Work management involves the inspection, surveying, maintenance, and construction of transmission-and-distribution facilities. The activities include those normally required for day-to-day control of construction, maintenance, and operations tasks—from receipt of a work request through design, scheduling, performance, reporting of completed work, and closing activities. Complementing work management is the materials management system, which tracks the inventory of stores (materials) to assure that sufficient materials are available to the work crews while assuring that capital is not tied up unnecessarily in excess inventory.

It is not unusual for utilities to have multiple work management and/or materials management systems. This is due to the varying levels of detail required—e.g., the number of facilities in a distribution network (100,000s) versus those in a coal fired plant (100s)—as well as to the different organizations involved (T&D versus plant).

### 5. Facilities Management

Facilities management normally refers to the management of distribution facilities—e.g., transformers, feeders, poles, pipes. It is easily confused with the delivery mode INPUT refers to as systems operations. Facilities management, the application, has a spatial context in that the facilities are stationary at a certain point of geography. FM has a connectivity aspect in that the facilities are interconnected to form a network. FM has a variety of other attributes of an engineering and accounting nature.

The geographic aspect of these systems is evident in the myriad maps maintained (some of the time) by utilities, often redundantly and contradictorily. Various departments have maps of the same territory and maintain them with information provided by different sources. As a

result, maps seldom agree and no one knows which is correct. But the map is only a reflection of the underlying function, which is to manage these facilities. In this sense, facilities management systems are data base systems that provide for geographically based output (maps).

As a data base system, facilities management is often confused with applications that make use of facilities data. These may be commercial, e.g., taxes based on political boundaries; engineering, e.g., flow analysis; or someday even operational as an actual SCADA data base. But in a purist sense, the facilities management system only maintains the data and does not apply it.

Facilities management systems have different requirements with respect to accuracy. For example, a gas utility in a major city needs to know rather precisely where its pipe is before it starts tearing into the downtown asphalt. On the other hand, an electric utility can be off by a wide margin if it is looking for the transmission line on the south forty of the Jones' farm. The importance of accuracy is not simply esoteric since conversion costs for facilities management systems have been known to increase exponentially with the level of accuracy required. Costs to convert from paper to computer records can represent half or more of the costs of a typical facilities management system.

**6. Supervisory Control and Data Acquisition (SCADA)/Energy Management Systems (EMSs)**

Some would argue that the most important utility systems in the 1990s are the SCADA/EMSs. This importance is predicated on the belief that at a time of limited supply, the ability to safely reduce margins in the transmission of electricity, gas, and water is the only way to meet demand. This reduction must be done in an era of deregulation that enables access to networks outside the control of the utility. In addition, it is argued, the wholesale brokering of energy, both electric and gas, vastly complicates the financial implications of utility day-to-day operations.

SCADA and the more advanced energy management systems are the backbone of utility operations. These systems monitor and control the utility network in real time. As such, these systems are responsible for the network's economical and reliable operation. These are sensor-based systems that feed into a control center, either directly or through a hierarchical control arrangement.

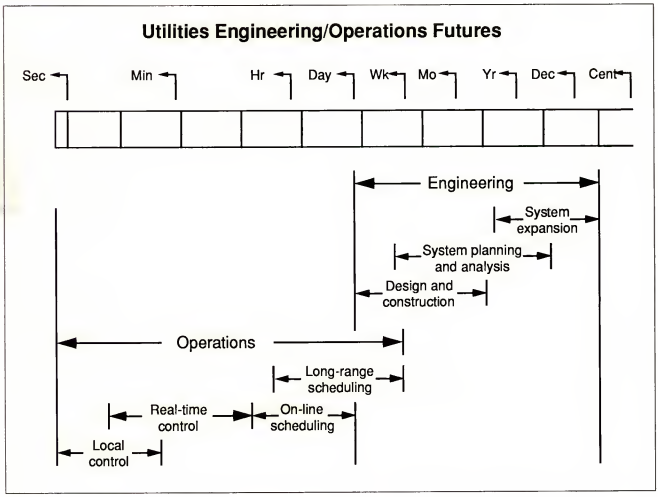
The introduction of open systems has had a profound effect on the SCADA/EMS market in recent years. Virtually all major suppliers in this turnkey market have espoused the benefits of distributed, workstation-based architectures; one supplier has already accomplished substantial development work. The cost implication of this approach is to halve the price of prior systems. These systems require long lead times, but the first truly open EMS can be anticipated in 1992, with many to follow.

SCADA is not limited to gas and electric. It is an important application in the water industry as well, although the consequences of a fault in the network are not usually as extreme. These systems are typically microprocessor based.

## 7. Engineering

Utilities have been described as both engineering marvels and engineering monuments. Nevertheless, it is a fact that engineering is at the core of what a utility does. Many utility executives have engineering backgrounds. In utilities, engineering and planning are closely related disciplines. The essence of a utilities engineering mission is to plan a system to meet a future demand. "Future" here can indicate different timeframes, as illustrated in Exhibit III-2.

EXHIBIT III-2



Systems expansion applications are focused on the system as it must be five and ten years from now and on the planning, design, and construction of required facilities. These include load forecasting, generation mix analysis, production costing, and environmental and facility land use analysis.

Systems planning applications look to a one- to three-year horizon and the reliable and economic operation of the network in conjunction with interconnected systems. These include load flow, transient analysis, and assorted engineering exotics.

Systems planning leads to design and construction activities with the related applications, including CAD/CAE, structural design, piping HVAC, economic analysis, and of course project management.

**8. Power Plant Applications**

The power plant is not really an application. It is a place. But because of its self-contained philosophy in most utilities, the plant is best viewed as an application unto itself, typically a very large application with many subsystems. As noted earlier, most plant systems were installed by the contractor (or more typically a subcontractor) and they lack integration.

For example, consider assigning a work crew to fix a leaky valve in a nuclear facility. One needs to know the history of repairs on the valve; who is available with the skills to do the job (plant maintenance system) and what materials they can use (materials system); how much radiation each has been exposed to (health physics system); how much radiation is in the area of the faulty valve (radiation monitoring system); and whom the access control system should admit. It's easy to discern the need for integration of these subsystems. A fully integrated system is referred to as a plant management system.

As might be expected, the driving application of the power plant is the work management system, usually called the plant maintenance system, a traditional transaction-based application, not all that different from its transmission and distribution (T&D) counterpart. The plant also runs a variety of engineering applications along similar lines to T&D. These applications are related to the economic use of fuel. Nuclear plants are exceptionally computer-intensive in this regard. The plant operations counterpart to an EMS is the plant monitoring and control system, a SCADA-type system used to control all the basic operations of the plant in real time.

New plants can be expected to be small and gas-fired, with less complex systems requirements than older ones. Successful vendors will team with the construction (AEC) firms to ensure that the systems are installed as part of the base plant rather than requiring a retrofit.

## C
## Information Systems Issues

The key issues facing the information systems function in the utilities industry are listed in Exhibit III-3. Each is discussed in this section.

EXHIBIT III-3

**Utilities Industry Information Systems Issues**

- Data integrity
- IS as an investment versus an expense
- Corporate systems
- Aging application portfolio

### 1. Data Integrity

During the early 1980s, with the advent of the PC and the information center, progressive utility information systems organizations took a proactive stance in helping end users make use of computer technology. They even went so far as to refer to end users as "clients." (Seldom did the clients reciprocate by referring to information systems people as "consultants.")

At first the tasks performed by these end users were somewhat trivial and limited to individual or at most departmental productivity. However, as the technology advanced and the PC went on-line, more and more end users downloaded corporate data into their PCs to manipulate it there. This downloading was fine so long as it was not represented as "corporate data." But recently, end users have used such data for a variety of purposes (such as representing the utility in a rate case) and have undermined the information systems organization's responsibility for the integrity and auditability of corporate data.

There appears to be a retrenchment under way from the open arms of the 1980s, when information systems reached out to end users. Instead, the approach is shifting to emphasize end-user accountability.

## 2. Information Systems As an Investment versus an Expense

With increased cost pressures on utilities, the information systems organization has come under more careful scrutiny. A philosophical debate over the role of information systems in the utility organization has developed. On the one hand, information systems can be viewed as an expense, a necessary evil, something out of the mainstream of what a utility is all about, and something to be trimmed and pruned to least cost. On the other hand, information systems can be viewed as an investment, a solution to the need to cut costs, and a lever to increase productivity. There is no unanimity on these alternatives within the industry.

Generally, information systems do not enjoy a high reporting status within the organizational structure and thus there is probably a propensity to view them as an expense. Interestingly, gas utility information systems executives seem to report higher in the chain of command—often to the COO—than do their electric counterparts.

## 3. Corporate Systems

As noted earlier, operations computing and, to a lesser extent, engineering computing have evolved independently from the commercial applications of the information systems organization. There appears to be a trend within the industry to assign responsibility for all computing to a single executive, a Chief Information Officer (CIO). Such a shift will require significant internal diplomacy and, as is true of most changes in utilities, time.

## 4. Aging Application Portfolio

After years of hacking away at an extensive application backlog, few utilities have made appreciable progress in exploiting the power of modern information technology. In part, this is due to the rapid change in the technology, but it is exacerbated by the complexity of utility information requirements.

- A recent study of 15 electric utilities showed that on average, the billing part of the Customer System was 18 years old, accounting 14 years old and materials management 12 years old. Those 15 utilities had a total of 20 replacement and 15 new applications under development.

- So the typical utility is installing one new and one old application at any point in time. If it normally takes three years to develop an application (and it does), the inference is that utilities will continue to lose ground to the application backlog—unless better development techniques are used or they make more use of external resources.

# D
# Impact of New Technologies

## 1. Image/Graphics

The massive amounts of utility paper records (particularly in a nuclear facility) require control and accessibility. Storage and retrieval programs have provided contextual search capabilities to abstracts that index the actual documents. The advent of affordable image technology offers an opportunity to control the documents directly. A critical requirement for utilities is the handling of engineering drawings, not just the standard 8.5" by 11" documents used in insurance and banking.

Image technology has also been related to graphics in the facilities management application and has enabled a more evolutionary conversion approach. In this case, old maps are image scanned. Gradually, as required by actual use, the raster images are vectorized and made manipulatable for engineering and other applications. This helps to spread conversion costs over a longer period and thus enables an earlier cost-benefit crossover.

Image also complements electronic data (or document) interchange—EDI—technology in enabling image documents (e.g., shipping lists) from vendors not implemented under EDI to be managed by the same system that manages the EDI records.

A classic application of image technology is in evidence at Texas Utilities (TU)'s Comanche Peak nuclear plant. Here, an enlightened management foresaw the need to manage the 50 million pages of multisized documents that must be accessible to appropriate parties to assure the safe, efficient operation of the plant. In 1991, TU replaced its people-intensive system with a mainframe-based image storage and retrieval system, dramatically enhancing productivity. The system is expected to expand steadily and will provide a basis for re-engineering many of the other areas throughout the enterprise. TU envisions application of image technology in publishing and CAD as well as storage and retrieval.

## 2. UNIX/Open Systems

The increasing popularity of UNIX and resultant open systems is seen by many in the engineering/operations community as an opportunity to avoid the pitfalls of proprietary solutions that have proven to be dead ends in the past. Newer systems feature a workstation-based distributed architecture with stunning price/performance and cross-vendor portability. Moreover, using interoperability, it is practical to tie these systems into the SAA architecture common to the central information network, thereby offering the potential of a cease-fire between information systems and the user community.

In the engineering/operations areas of utilities, it is no longer a question of whether UNIX will be implemented, but of when. Typically, this is answered by "with the next change-out" (utility vernacular for "when we re-do the application"). However, with the increasing focus on integrating applications, that answer may no longer suffice. Specifically, the rapid growth of facilities management systems, coupled with their swing position between commercial and engineering applications and the fact that virtually all major AM/FM vendors are going to UNIX-based solutions suggest that AM/FM decisions may drive the platform for other applications that exploit the AM/FM data base.

On the commercial side, there is appreciable interest in UNIX, particularly for smaller utilities, but mainly as a vehicle to tap the price/performance of workstations. There appears to be nothing unique to the utilities sector here and the issue will be resolved based on how the mini/micro hardware head-to-head competition as exemplified by IBM's AS/400 versus RS/6000 product differentiation issue shakes out.

### 3. Relational Data Base Management Systems

During the mid-1980s, utilities began to dabble in relational data bases, particularly DB2. At first there was a reticence to use this approach on mainstream applications such as CSS. However, today there is no hesitation. The corporate information systems organization has embraced DB2 and no packaged commercial application solution is likely to meet with success unless it is available under DB2.

Today, all commercial data base managers are proprietary. However, some, such as Oracle, have a multivendor strategy and, as a result, are becoming increasingly popular for engineering applications. They have not entered the operations world yet because of the stringent real-time performance requirements there, but their entry will likely only be a matter of time.

### 4. Data/Voice Integration

Utilities are showing increased interest in employing advanced communications technologies to enhance their relationship with their customers. In its simplest form, voice systems can provide account information to customers. In a more sophisticated form and capitalizing on Automatic Number Identification (ANI) technology, customer service reps can have the first screen displayed without asking for the customer's name or number.

In an even more sophisticated system, involving the integration of several systems, an out-of-service customer can be automatically identified (CSS), the outage related to a specific transformer (facilities management), a crew

dispatched (work management), and the customer advised on how long the outage is anticipated to be (or even called back at intervals to provide an update on progress)—all automatically.

At Northeast Utilities, a pilot system using ANI has been installed. NU's subsidiary, Connecticut Light & Power, projects that based on the 2.5 million customer service calls it receives per year, ANI will save the work of eight additional customer service reps while reducing the percentage of unanswered calls from 9% to 3%.

### 5. CASE Methodologies

Utility interest in the use of CASE (computer-aided software engineering) technologies is growing, understandably because of the large transaction-based systems that form such a critical part of the application portfolio. Selection of CASE tools offers the same pitfalls as any major architectural choice—language, operating systems, etc.—in that resulting systems will be locked into that CASE tool for future maintenance. In some situations the lock extends to the services of the owner of the tool. As a result, some utilities are selecting CASE tool vendors, such as Texas Instruments, that are unlikely to exploit such a relationship.

### 6. Artificial Intelligence

Expert and knowledge-based systems have been developed for utility applications ranging from plant operations (alarm response advisor, fire protection review, machine vibration diagnostics) to rate analysis. In general, they are aimed at addressing skills shortages that have increased as a result of industrywide downsizing. Utility reactions to artificial intelligence have been mixed—some hold the view that AI is more a technique than a technology and that economic justification is questionable.

## E
## Information Systems Organization and Budget

More often than not, the information systems organization reports within the financial function of the utility. Typically, the VP of information systems reports to the CFO or the VP of management services. It is not uncommon for this executive to have other responsibilities, ranging from purchasing to facilities.

Comparison of utility information systems budgets is a difficult task because of different inclusions and exclusions. For example, some budgets treat data entry as an information systems expense, whereas others charge this function to the user department directly. Similarly, some

budgets include some or all of the costs of engineering or operations computing. Others do not. Data and/or voice communications may or may not be included. As a result, without considerable analysis it is difficult to compare budgets.

Information systems budgets have capital and expense elements. In general, capital outlays for utilities can be added to the rate base and the utility can earn a return. At the same time, large capital expenditures may require review by the PUC—the utility must defend the prudence of its management decisions.

Utilities make great use of ratios in comparing various facets of their operations. Of particular relevance to the information systems community (subject to the caveats mentioned earlier) is the information systems budget as a percent of revenue. A representative figure in the utility industry is 2.8% in a range of 1.0% to 4.0%. (The average for the four non-telephone utilities included among the 1991 Computerworld Premier 100 installations was 1.92%.) Such numbers can be dangerous, however. Whole power plants, SCADA/EMS, remittance processing, bursting, and meter readers may or may not be included. As a result, comparisons may be erroneous.

Generally speaking, utility information systems budgets will be under appreciable pressure through 1996. A recent survey of 15 electric utilities indicated a negative annual growth rate of 2% from 1990 to 1994. More recent surveys suggest that utility IS budgets may have bottomed out in uninflated dollars. However, because of downsizing, a larger proportion of the information systems budget will be spent on outside services to compensate for reduced staffing in information systems.

## F
## Information Systems Organization Objectives

Exhibit III-4 lists the key objectives for the information systems function within the utilities industry.

EXHIBIT III-4

**Utilities Industry**
**Information Systems Objectives**

- Be the solution to, not the victim of, downsizing
- Gain attention/respect of top management
- Fulfill corporate role while controlling end users
- Expand information systems to engineering/operations

The objective of most utility information systems executives is to get respect. This means that they strive to convince senior management of the importance of the information systems' role to the strategic interests of the utility. They seek a seat at the "councils of war" so that they will be recognized as contributors.

To gain this respect, information systems executives seek ways in which their systems can be more responsive to the changing culture of utilities. Examples of such systems are a tax model to assess the implications of various alternatives in a merger negotiation, an energy management system to support the brokering of power with neighboring utilities, or a gas SCADA system to track specific gas supplies by pipeline within the distribution system and thus enable the most economical choices to be made.

# IV

# Information Services Market

IV

# Information Services Market

## A
## Overview

### 1. Make or Buy

Utilities have historically tended to develop their own systems in-house, albeit that tendency has softened considerably in recent years. Several characteristics of the industry influence this in-house tendency:

- The relatively large transaction systems on the commercial side
- The perceived uniqueness of each utility on the engineering and operations sides
- The cost-plus attitude from which the industry has evolved

Recently, however, the need to be competitive has resulted in utilities giving more careful consideration to prepackaged or outsourced solutions. Still, the successful vendor must frequently overcome a not-invented-here attitude that suggests, "We're unique; we're different; we'll do it ourselves."

### 2. Propensity to Use Consultants

The utility industry uses a great deal of outside consulting services. This dependence is largely the result of the industry's need to defend itself to the PUCs by being able to demonstrate that decisions were well considered and made use of the best available expertise. Use of consultants applies to information systems matters as well as to the rest of the utility organization. Some consulting firms have capitalized on this tendency by expanding their services from broad information systems consulting to include specific application skills and solutions.

### 3. End-User Computing

Utilities pioneered on-line systems in the customer system application of the 1960s. That tradition continues. In the 1991 Computerworld Premier 100 ratings, the four utilities ranked averaged .69 PCs/terminals per employee. This placed the utilities second only to the paper-intensive financial services industry in this regard. What is particularly remarkable about this number is that fully 54% of utility personnel are categorized as production workers, leaving only 46% in jobs where one would expect computer access to be the norm.

## B
## Delivery Mode Trade-Offs

Earlier we discussed some of the differences among the commercial, engineering, and operations organizations and applications within the utility. These differences result in different approaches to services. The information systems organization today actively considers the applicability of outside solutions before deciding on in-house development. This consideration is clearly true in areas such as resource management, but increasingly so in the previously sacrosanct customer system. On the engineering side, applications packages are more a way of life, while operations favors a more customized, systems integration approach.

## C
## Delivery Mode Analysis

Exhibit IV-1 illustrates the primary delivery modes by application. It is not intended to suggest a cookie-cutter view of this relationship, but rather a general view of the market and its breakdown into commercial, engineering, and operations segments. The following describes some of the major considerations by delivery mode.

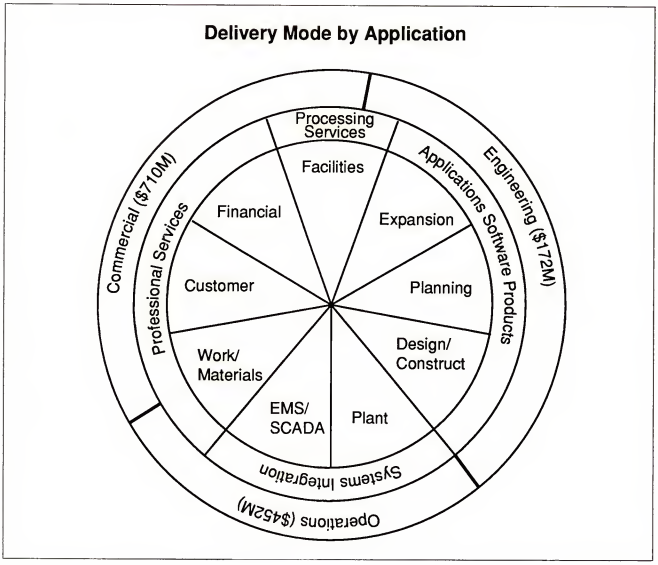
### 1. Processing Services

Relatively small utilities, such as REAs and municipals, frequently use processing services for day-to-day transaction processing.

A rapidly growing market is the conversion of facilities records to computer form—a labor-intensive, one-time but long-time, multiyear effort.

The complexity of "nuclear codes" (nuclear-plant-unique engineering programs) and the high-performance requirements to run these number-crunchers have led to a significant on-line, frequently interactive services market in this niche of 70 or so electric utilities with nuclear power plants.

EXHIBIT IV-1




## 2. Network Services

The major uses of network services in utilities are the traditional LEXIS/ NEXIS-type services.

Demographic data bases, available either on-line or as a package, offer utilities a complementary view of their customers and prospects and are a useful addition to a marketing support system.

Perhaps the greatest growth potential for network services in utilities is in the area of EDI, which enables on-line interchange between utilities and their many suppliers. The logical extension is to tie utilities into their major corporate customers as well.

### 3. Applications Software Products

The use of applications software products is growing rapidly in the industry. Cross-industry applications—e.g., stockholder and administration human resources (not considered in this report)—are the most widely accepted. However, the use of utility-unique application code, often modified by the utility or the vendor to meet the specific requirements of the individual utility, is also growing rapidly. Customizing, particularly for larger utilities, is the rule, not the exception.

### 4. Turnkey Systems

Utility operations frequently refer to their sensor-based control systems as turnkey. However, these frequently employ specialized hardware and are considered systems integration projects in this report.

Small utilities, typically fewer than 50,000 customers, are the core turnkey market in utilities. The application set is usually limited to customer support systems, with emphasis on billing.

### 5. Systems Integration

The major operations-type applications in utilities are all systems integration opportunities. In addition, there is an increasing requirement to integrate operational systems with other corporate systems. This integration is intended to enhance overall efficiency of day-to-day operations, and to align them with strategic goals such as power brokering.

### 6. Professional Services

Two elements favor the use of professional services: on the systems side, the increasing complexity of modern technology makes it difficult for utilities to staff the technical skills needed on a permanent basis; on the applications side, the age (10-20 years) of these systems (plus the many retirement incentive programs) have left utility staffs devoid of the application know-how needed to develop replacement systems.

Utilities have long understood the concept of peak shaving. Hence, the use of outside resources is normal business procedure.

### 7. Systems Operations

The recent interest in operations outsourcing has aroused appreciable interest among utility top executives. Outsourcing of the central data center should receive increased consideration as cost pressures continue in the next few years. However, unlike other industries, few utilities have made significant outsourcing decisions at this point.

A special consideration in utility outsourcing is that utility capital expenditures form a part of the rate base on which utilities earn a return. Consequently, a utility should maximize its rate base by assuring that information systems operations (and therefore the associated capital costs) are part of the utility itself. On the other hand, these expenses are rather inconsequential and the rate base has become less a factor in the rate-making process.

## D
## Industry Segment Considerations

Like most industries, utilities are composed of many segments, as shown in Exhibit IV-2. Perhaps the most useful single division, however, is between the large and small (with a line arbitrarily drawn at about 200,000 customers). Above that point, there is a mainframe orientation, a not-invented-here approach, and a wide spectrum of application requirements. Below that point is a distribution-only, mini- and micro-system-scaled market with no substantive information systems staffs, and an increased reliance on outside services and solutions. As a result, these utilities offer more of a turnkey, applications software opportunity. However, the budgets at this lower level are minor compared to budgets at larger utilities.

EXHIBIT IV-2

**Small versus Large Utilities Segment Considerations**

| | Commercial | Engineering | Operations |
|---|---|---|---|
| Small (<200K) | Turnkey, Processing Services | Applications Software | Turnkey |
| Large (>200K) | Professional Services, Systems Integration | Applications Software | Turnkey |

Municipal utilities are a special case in that perhaps 90% of them do not have a separate utility function. They purchase software and services to support a host of functions—e.g., police, fire, taxes, and schools—of which utilities are but one. Consequently, successful vendors must offer other municipal applications as well as utility applications to succeed.

In utility engineering applications, there is a sharp physical distinction between electric and fluid (gas, water). As a result, successful vendors tend to focus on one or the other.

## E

## Forecast

The driving forces noted in Exhibit IV-3 result in an information services forecast influenced by conflicting considerations. The increasing cost-consciousness of utilities reduces services opportunity since there is less to spend. At the same time, cost-consciousness increases opportunity since there are fewer in-house capabilities. The result is a mixed bag.

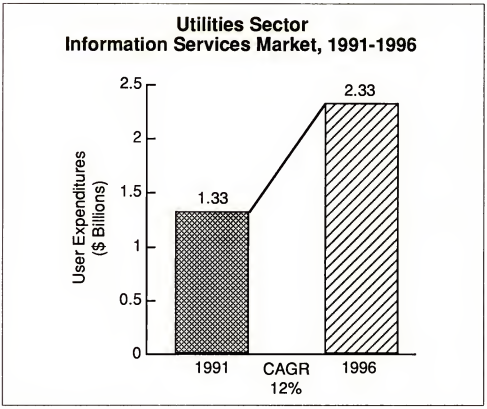
EXHIBIT IV-3

**Utilities Industry Driving Forces**

- Regulation
  - Federal deregulation
  - State reregulation
- Competition
  - Marketing
  - Open access
- Costs
  - Plant operations
  - Asset management

As shown in Exhibit IV-4, INPUT projects that the information services market within the utilities industry will grow from $1.33 billion to $2.33 billion, a CAGR of 12%, over the five-year period 1991 to 1996. Thirteen percent is consistent with the 13% average annual growth rate projected by INPUT for the 1990-1995 period.

EXHIBIT IV-4




Forecasted growth of each delivery mode is depicted in Exhibit IV-5.

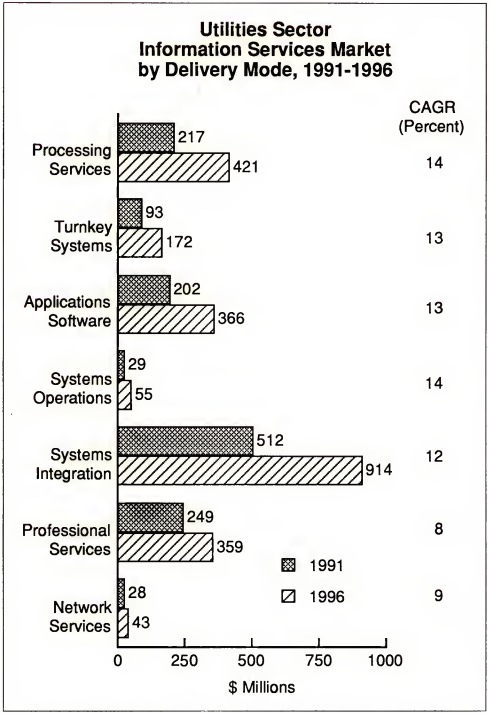
- The most significant growth is in applications software, driven by large utilities opting to use packages, trading their tradition of internal development for cost and response considerations.

- There is significant growth in the systems integration delivery mode, largely driven by increasing activity in SCADA/EMS and power plant control systems aimed at optimizing the use of existing facilities. Systems integration represents a new alternative to the utilities industry and is being well accepted, but at a slower rate than in other industries.

- Systems operations activity will also accelerate, albeit from a relatively small base. Historically, information systems investments—including the corporate data center—have added to the investment base and thus the measurement relative to rate setting by the PUC. Changes in this orientation should begin to make systems operations a true alternative in the utilities industry over the next few years.

- Processing services growth has upward pressure from facilities management conversion services that is slightly offset by declining transaction processing services in the low-end market. The latter will be impacted by increasing penetration of turnkey customer systems solutions.

EXHIBIT IV-5

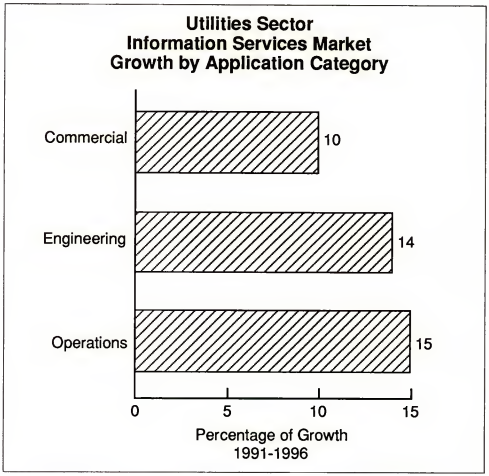



- Network services growth is influenced by the slow but inexorable growth in utility EDI. However, because most utilities are regional, their needs for network services do not match those of other industries. The market for these types of services is quite modest in the utilities industry.

- Professional services growth will be constrained by dampening demand for unique high-function customer systems in favor of more packaged applications software solutions.

Exhibit IV-6 depicts the growth rates in each of the three major utility application classes.

EXHIBIT IV-6




The fastest growing area is operations, fueled by the need for systems integration services to enhance the reliability of plants and by T&D networks that will operate closer to their margins as new plant construction fails to keep pace with growing demand. Similarly, in the gas industry, it will become more important to track gas as it becomes a more valuable commodity. Even for wastewater utilities, public demand for environmental protection means higher levels of treatment that require plant process control.

The engineering side also shows appreciable growth. Although engineering associated with new plant construction is down, this was typically done by AEC firms anyway. Utilities will focus their engineering resources on the design and construction of enhanced transmission and distribution facilities with the accompanying demand for systems planning and CAD/CAE packages.

Largely because of a retrenchment from the large expenditures made by the early pioneers in DB2-based customer systems and a shift toward packaged rather than custom solutions, the commercial application set shows the least growth.

# V

# Competitive Environment

# V

# Competitive Environment

## A

## Vendor Characteristics

### 1. Lack of Dominant Players

The utility information services market is composed of a variety of niche markets in which no vendor is truly dominant overall. To some extent, the lack of a dominant vendor is the result of the different application sets (commercial, engineering, operations) and therefore different buyers, as already discussed. In addition, the lack of dominance is the result of the different disciplines these groups represent. However, the major reason for the lack of coherence is that no vendor has chosen to make the across-the-board investment necessary to stake out a major claim. Exhibit V-1 illustrates this fragmentation.

### 2. The Big Six

The most aggressive players in the utilities services/solution scene have been the "Big Six"—formerly accounting firms, but today just as much IS services firms. Within this group and for the industry as a whole, the leader is Andersen Consulting, which has parlayed a relatively small group of application specialists into a worldwide systems integration/ professional services business in utilities. Second is Price Waterhouse, which, with the acquisition of ACTRON in 1988, added a customer service application package to its utilities offerings and is currently promoting a somewhat amorphous service 2000. Other Big Six players are also involved with utilities, but more in a general IS consulting mode.

### 3. Hardware Manufacturers

Of the hardware manufacturers, IBM and DEC have the dominant market share for their hardware products. On the services side, DEC has continued its strategy of working through business partners IBM, on the other hand, has become more aggressive in addressing the services opportunity, but still has a long way to go to reach Andersen Consulting.

EXHIBIT V-1

**Application Focus of Information Services Vendors**
**Utilities Industry**

| Commercial | Engineering | Operations |
|---|---|---|
| A & C Enercom | ACG | ABB |
| Andersen | ADL-Pipe | ATS |
| ASI | EPC | ECC |
| CS & A | ESRI | EMPROS |
| Daffron | Geovision | ESCA |
| EDS | GSC | ILEX |
| Hansen | Intergraph | Impell |
| IBM | Milsoft | INDUS |
| Mentor | PTI | MDI |
| Orcom | Scott & Scott | NUS |
| Price Waterhouse | Stoner | SAIC |
| Qualtec | Stone & Webster | SEI |
| Saratoga Systems | Synercom | STAGG |
| Silverio | UGC | Tenera |
| TTI | Westinghouse | URI |

### 4. Others

Many firms specialize in specific utility applications. Some firms market applications to many industries, of which utilities are but one; other firms market only to utilities. In addition, many utilities have tried to market their own software to other utilities.

# B

## Leading and Emerging Vendors

### 1. Customer Support System

For this backbone system, Andersen is the clear leader because of its reference installations at several major utilities. Price Waterhouse became a player with the acquisition of ACTRON. IBM's Utility Customer Design Service (UCDS) is beginning to catch on. CS&A has a flagship system at Cincinnati G&E. An intriguing recent entry is The Alliance, a combined venture of TSC and Planmetrics. All competitors offer products on IBM mainframe architecture.

An interesting new form of competition is the idea of a multiple utility consortium. History suggests these amalgams will fail due to disagreements over system requirements.

At the low end, processing services such as Central Area DP have a major share of the cooperatives market. Mentor Systems, Daffron, and ORCOM share the applications software side. Rural electric cooperatives require significant professional services in addition to application packages.

### 2. Marketing Support Systems

A&C Enercom is the most broadly based supplier of talent and tools in this area. Saratoga Systems has been successful in marketing its territory management software to the utilities industry. Donnelley Marketing Information Systems continues to market its geo-demographic data base to utilities, particularly electrical. IBM sees its Data Interpretation System (DIS), originally developed by Metaphor, as a key analytical tool for utility market support systems.

### 3. Financial Systems

As might be expected, the financial systems market is dominated by the accounting firms. Andersen Consulting has an agreement with Duke Power regarding the marketing of Duke Power's financial package, but is having little success. The EDS/Westech combination in this area of systems requirements is worth watching.

### 4. Transmission and Distribution Work/Materials Management

In addition to TTI Technology marketing the SCANA software implementation of DCIS, Severn-Trent Water from the U.K. is marketing a version of the same software on an international basis (including the U.S.). Andersen Consulting can be expected to push its work management solution, recently acquired from URI. Again, EDS is notable with its materials management package acquired from GPU.

### 5. Facilities Management (The Applications)

The leader in facilities management is Intergraph, which survived a shift in product direction in recent years upon which others failed to capitalize.

Triggered by low-cost, high-function workstations, the facilities management market has taken an interesting turn toward UNIX-based implementation. The leaders include Geographic Systems Corp., GeoVision, Synercom, and Intergraph. IBM has finally entered the fray with its long-awaited AIX solution and has taken an equity position in Utility Graphics Consultants (UGC), a well-established automated mapping/facilities management (AM/FM) consulting firm.

The industry continues to look for the highly sought breakthrough that would enable a dramatic reduction in records conversion costs.

### 6. SCADA/Energy Management

In SCADA/EMS, the industry is taking a sharp turn toward open systems and UNIX. STAGG Systems was the first EMS supplier to announce a truly open architecture—the EMS/6000 product—and will be the first to install it (in early 1992). In response to market demand for UNIX-based SCADA/EMSs, DEC-oriented EMS suppliers are expected to port their VMS offerings to UNIX.

### 7. Engineering

Much of the engineering market is influenced by the focus on open systems and the price/performance of workstations. CAD/CAE for a variety of design functions has taken a firm hold in larger utilities. In addition, commercial relational DBMSs (e.g., Oracle) are receiving considerable attention.

### 8. Power Plant Applications

A half-dozen vendors contend for the lucrative plant maintenance system dollars while various consortia attempt to show leadership in integrating the islands of information that continue to float unconnected.

# C
# Vendor Profiles

### 1. A&C Enercom, 5030 East Sunrise Drive, Phoenix, AZ 85044 602-893-3310

A&C Enercom, a subsidiary of Cape & Companies, represents a unique force supporting utility efforts in demand-side management. With a staff of over 500 employees in 20 offices nationwide, it provides virtually any service that will support a utility's marketing or conservation programs—from market research using the most modern tools and methodologies to implementing marketing programs.

The A&C Enercom software portfolio includes energy analysis software for residential and commercial facilities, turnkey project management systems, and marketing information systems. But because of its breadth and focus, the company is exceptionally flexible in providing systems integration, turnkey or professional services solutions within its niche.

Because of the tightening relationship between demand-side management and a variety of computer applications—e.g., load management, AMR, and distribution SCADA—A&C Enercom can be expected to become more active in forming alliances to leverage its already considerable solution base.

### 2. American Software, Inc., 470 East Paces Ferry Road N.E., Atlanta, GA 30305, 404-261-4381

American Software, Inc. (ASI), founded in 1970, develops, markets, and supports business applications software for IBM and compatible mainframes, minicomputers, and microcomputers in a range of vertical markets, including the utilities industry, which accounts for about 12% of its revenues. In 1990, ASI witnessed dramatic growth in the utilities segment spurred by an enhanced international marketing capability coupled with demand for the IBM ES/9000 processor line.

ASI's major offering is an integrated solution for inventory management, work orders and maintenance management, procurement, inventory control and accounting called UTILITIES-8. The DB2 version is being successfully installed, having received full accreditation under IBM's program. Consistent with ASI's SAA-based strategy, a Warehouse Management offering operating under OS/2 began delivery in 1991. Demonstrating the ability of ASI to downsize mainframe software to a micro platform, ASI offers its CICS-based software under CICS/OS/2. ASI continues its research efforts in evaluating the use of UNIX and distributed technologies to the commercial application set.

**3. Andersen Consulting, 2 North Central, Phoenix, AZ 85004, 602-251-2627**

Utilities are one of the seven vertical markets addressed by Andersen Consulting, the largest integrator of utility information systems. Approximately 10% of Andersen's 18,000 worldwide professional employees are involved with utility systems at any time.

Andersen Consulting competes across the entire utility application spectrum in all delivery modes, but with particular emphasis on systems integration for customer systems, financial systems, maintenance, and facilities management systems. About half of Andersen's systems integration business is fixed-price.

Andersen offers a proprietary CASE technology called FOUNDATION, which is composed of METHOD/1, PLAN/1, DESIGN/1, and INSTALL/1. CUSTOMER/1 is a specific implementation of this technology for utility customer systems. Also under FOUNDATION are TPS (Total Plant System)/PRISM and WORK/1, a T&D work management system.

A key strategy for Andersen Consulting focuses on the selection and training of quality professionals. Their skills, which are geographically dispersed, are leveraged by centrally located pockets of expertise. Extensive networking capabilities are used to optimize the availability of critical skills to specific customer needs. Recently, Andersen Consulting has moved utility programming assignments off-shore to the Philippines. Given its preeminence in the international utilities marketplace, Andersen Consulting can be viewed as a formidable competitor in all aspects of information systems services for utilities.

**4. Electronic Data Systems (EDS), 7171 Forest Lane, Dallas, TX 75230, 214-490-2963**

EDS provides a wide variety of services involving the selection, application, and support of information systems technologies. In 1990, EDS recorded more than $6 billion in revenue.

EDS's utilities focus is part of its Energy Strategic Business Unit (SBU). The broad strategy is to offer a range of services that depend on the needs of the specific utility, but are not limited to traditional facilities management. The company enhances these services with offerings that recognize the growing cost containment interest in utilities. The Energy SBU expects to grow at more than 20% compounded annually; EDS plans to be a leading provider of information technology services to utilities by 1995.

EDS competes across the entire range of delivery modes, but with particular emphasis on systems operations outsourcing, systems integration, professional services, and network services.

EDS's 28 years of experience have resulted in particularly strong skills in large commercial systems, data base technologies, and multivendor connectivity. This mix of skills lends itself nicely to the development of customer support systems in utilities as well as the integration of discrete systems in power plants. In addition, EDS has extensive experience in large financial systems.

In 1991, EDS acquired rights to a materials management package developed by GPU, as well as to a considerable amount of applications software developed by BC Hydro and its software subsidiary, Westech. The latter includes a comprehensive financial management package already successfully installed in the U.S. utility market.

EDS stresses close involvement and long-term relationships with its clients.

**5. Intergraph Corporation, Huntsville, AL 35894, 205-730-2000**

Intergraph, in addition to being the number-one supplier of CAD/CAM systems, has the longest sustained record of any serious utility AM/FM vendor, dating back to the mid-1970s. The company has transitioned from a DEC VAX-based platform to a distributed solution based on its own workstations and various servers. The hardware exploits UNIX as its operating system and is complemented by Intergraph's base software package, FRAMME (Facilities Rulebased Application Model Management Environment). Intergraph provides support through a variety of services that include training, maintenance and consulting.

In an effort to add arms and legs to a rapidly growing AM/FM market, in 1989 Intergraph instituted the Intergraph Registered Consultant (IRC) program. IRC provides free training to qualifying AM/FM consultants.

An active user group meets quarterly and identifies requirements for future development. The utilities subgroup has been effective in lobbying for enhanced interfaces to PCs, X-Windows, SCADA and analysis-type applications.

Intergraph can be expected to exploit its market share advantage in the AM/FM industry by doing what it does best—integrating the graphic and data base sides of AM/FM and growing its alliances in related applications.

**6. IBM Corporation, 44 South Broadway, White Plains, NY 10601, 914-288-3085**

In addition to being the leading hardware provider to the utilities sector, IBM has taken a more active role in the services aspect of this market in recent years. IBM competes in all delivery modes, but with particular emphasis on systems integration and professional services.

In the fall of 1988, IBM publicly proclaimed its new focus on service offerings for utilities. IBM announced UCDS (Utility Customer Design Service), an amalgam of professional services and a base customer system design that originated at Southern California Edison. The geographical systems skills of IBM Professional Services are complemented by application skills from IBM's Utility Industry Marketing organization in support of UCDS. With UCDS as its base, IBM actively pursues professional services opportunities in any facet of the customer system.

CASE technology represents a major element of IBM's services opportunity. AD/Cycle is an application development strategy that supports IBM's Systems Application Architecture (SAA) standards. AD/Cycle consists of four components: transition management, the methodology series, the performance series, and the knowledge series. The performance series includes tools developed by Bachman, Index Technology, and KnowledgeWare.

In 1991, IBM formed a subsidiary, Integrated Systems Solutions Corp., aimed at providing data center and systems integration outsourcing as well as related services. IBM was successful in landing the first major data center outsourcing contract in the U.S. utilities industry, at Yankee Gas.

Moving from a relatively small base, IBM's revenue growth in utility services has been faster than that of the overall industry in 1989-1991. That growth is expected to continue; IBM will be a challenger for the lead by 1996.

**7. STAGG Systems, Inc., 901 Threadneedle, Houston, TX 77079, 713-496-3470**

STAGG Systems, Inc. is an energy management system (EMS) supplier specializing in turnkey systems to the electric utility industry. In 1990, STAGG acquired the MPRO division from EI, and expanded its offerings to include work management (maintenance) systems.

STAGG was founded in 1970 and from its inception has focused on power systems applications, process computing, man-machine interfaces, data acquisition, on-line data bases, and intercompany communications. STAGG has pioneered many innovative EMS concepts, including a modular design that withstands obsolescence, the industry's first large-scale state estimator, the first interactive multiuser load flow (a major program that calculates electrical measurements within a network), and the first full graphics system.

In 1989, STAGG became a wholly owned subsidiary of Arizona Public Service Company. Coincident with that acquisition, STAGG focused its development resources on the first distributed, workstation-based, open EMS in the industry. This was announced as EMS/6000 in February 1990, coincident with IBM's announcement of the RISC System/6000.

EMS/6000 offers an EMS solution under UNIX with distributed workstations interconnected by a high-performance token ring LAN and software written in the easily ported C language.

STAGG's strategy is to capitalize on its real-time and application strengths as well as the price/performance of its platform to expand vertically in the real-time field (SCADA, Distribution Automation) and horizontally into related application areas (work management, facilities management, etc.) through alliances or acquisition.

**8. Stoner Associates, P.O. Box 86, Carlisle, PA 17013, 717-243-1900**

Stoner Associates provides software and related services primarily to the U.S. gas and water utility industry. Founded in 1970, Stoner is the preeminent supplier of computer solutions to fluid flow problems. Its revenues were over $8 million in 1990.

In May, 1991, Stoner was sold by its parent, Philadelphia Suburban Corp., to Severn Trent, PLC. The latter is a 3.5 million-customer water utility in Birmingham, U.K. that has pursued a strategy of diversification since the privatization of the U.K. water industry.

The primary offering from Stoner is SWS (Stoner Workstation Service). SWS graphically simulates steady-state gas pipelines and has a variant for water pipelines. This market can be expected to gradually migrate to UNIX/relational technology, and Stoner plans to pursue that opportunity under multiple-vendor platforms.

In addition, Stoner provides unsteady-state analysis pipeline simulators. The company will gather all data needed to create a facilities data base and digitize that data, including geographic coordinates, on a turnkey basis. Stoner's strength in the gas segment is obvious when one considers that two-thirds of gas-heated U.S. homes are served by utilities using Stoner software. Its wholly owned DREM subsidiary already provides pipeline simulation under UNIX with the SCADA system in a market that increasingly seeks integrated real-time capabilities.

Stoner's strategy emphasizes advanced engineering with a steady stream of functional and platform enhancements, combined with outstanding customer support (Stoner trains more than 1,000 engineers a year).

**9. Synercom Technology, Inc., 2500 City West Boulevard, Suite 1100, Houston, TX 77042, (713) 954-7000**

Synercom provides integrated AM/FM solutions to the utilities, telecommunications and government sectors. Several years ago, Synercom phased out of its hardware manufacturing operations in favor of a systems integrator role predicated on its base software offering, INFORMAP. Consequently, Synercom has embraced a vendor-independent strategy exploiting UNIX portability and has signed agreements with DEC, DG and IBM for hardware, and ORACLE for DBMS. Synercom has additional agreements with AUDRE (digitizing), Interleaf (publishing), and Stoner (fluid modeling).

As the market increases its focus on distribution automation, Synercom has expanded its offerings to include a work management function using the same relational data base as INFORMAP. Future plans include further integration with SCADA and trouble reporting systems.

**10. TTI Technologies, Inc., 6200 Courtney Campbell Causeway, Tampa, FL 33607, 813-281-1002**

TTI Technologies specializes in systems integration and software product solutions for electric and gas utilities. TTI is a wholly owned subsidiary of AGS Information Services, which in turn is owned by NYNEX. AGS also owns Stockholder Systems and Real Decisions, which also do business in the utilities sector. Formed in 1986 as TECO Technologies, a joint venture between Tampa Electric and its principals, TECO Technologies was acquired by AGS in late 1989 and its name changed to TTI Technologies.

TTI's flagship is its mobile communications/dispatching product. Mobile Data Exchange (MDX) enhances communications between the office and field personnel by using mobile field terminals tied to radio communications links to the central processor. TTI's work management system, Distribution Construction Information System (DCIS), nicely complements its MDX offering and provides a comprehensive DB2 solution to that related area. TTI's Meter Records and Inventory System (MRIS) is also a DB2 solution to meter inventory, installation history and testing.

TTI has shown steady growth and has gained appreciable experience in working with over 75 utilities. The average water utility customer pays $200 annually for service.

# VI

# Conclusions and Recommendations

# VI

# Conclusions and Recommendations

## A

## Industry and Information Services Market Conclusions

### 1. Excellent Services Opportunities

With competitiveness and cost-consciousness now part of the industry, the time has come for a rapid acceleration in the use of outside services to enhance utility efficiency. This acceleration is in the interests of vendors and users alike. But utility wheels grind slowly and it would be unrealistic to anticipate too dramatic a change. Rather, one can expect an evolutionary shift.

Given the aging of many systems, their incompleteness and lack of integration, and the rapid pace of technology, a substantial application backlog exists in most utilities. The cost squeezing of utilities in recent downsizings—IS organizations included—creates even more pressure on that backlog.

IS organizations are under pressure to respond to the corporate need for efficiency. This pressure is IS's opportunity to improve its position in the corporate hierarchy and some organizations will try to capitalize on it.

For all these reasons, the outlook for utility services/solutions looks bright throughout the 1990s.

### 2. Applications Software Products/Systems Integration Opportunities

The most attractive delivery modes appear to be applications software products supported by systems integration capabilities that appeal to the industry's need to address the backlog with reduced staffs and to reshape internal operations for a more competitive environment.

### 3. Opportunities in Operations

The systems integration opportunity in utility operations applications is perhaps the most readily overlooked, requiring as it does highly specialized expertise. But the advent of UNIX/workstation/distributed technology offers the prospect of replacing current dead-end systems with systems based on standard upgradeable hardware/software that integrates well with other corporate systems. Internal utility politics remain the greatest inhibitor.

### 4. Package Opportunity in Engineering

Application packages are the primary solution for engineering applications. Engineers seek functionality and data base approaches so that studies are repeatable and can be applied to changing parameters. Applications that work with the widely accepted CAD/CAM and Intergraph graphics systems have the greatest chance for acceptance. Here again, interfaces to corporate systems are important.

## B
## User Issues and Recommendations

Little has changed in the past year regarding areas of critical importance to users and information systems within the utilities industry.

### 1. Data Integrity

The IS community in many utilities needs to establish itself as a pro-active force with a legitimate mission to manage the data assets of the utility. This change requires a listening ear at the top of the business, and the establishment of a Chief Information Officer (CIO) level of authority, if not title. Education of senior management in this regard is critical. Vendors and consultants with established credentials—not just in esoterics but in organization, management, marketing, and the utilities industry itself—can help.

### 2. Integration

Many larger utilities have major commercial systems installed. However, these systems are not integrated among themselves, much less with engineering or operations. There is a significant opportunity for systems integration to improve the application investments already made.

## C

## Information Services Vendor Issues and Recommendations

The opportunities for vendors are also essentially unchanged from the 1990 analysis. The utilities sector continues to increase its willingness to look to external sources for improved return on its information systems efforts and investments. Vendor recommendations are in Exhibit VI-1.

EXHIBIT VI-1

**Vendor Recommendations**

- Funding patience
- Integrated solutions
- Platform support
- Balanced marketing

### 1. Funding

Most utility applications are large, complex, and require a lengthy sales and implementation cycle with or without outside services. As a result, vendors must have financial resources to handle front-end cash flow problems even beyond the normal startup/development costs.

### 2. Integration

Although the industry seeks integrated systems solutions, few vendors are able to develop all the required pieces. The successful vendor will form strategic alliances with other firms that have complementary, compatible offerings. Critical to this strategy is that the architecture of these systems be consistent.

### 3. Multiple-Platform Support

There is a temptation to attempt to be all things to all people, suggesting that a vendor wishes to support a solution on many platforms. The successful vendor seeks to address markets where there is some coherence without incurring inordinate development/support costs for multiple platforms. UNIX is an approach, but probably not a panacea. The key is to accurately assess marketing advantage versus development/support costs.

## 4. Balancing Marketing and Development

Critical to success in the utility market is the balancing of marketing with development. This balancing is particularly critical in the systems integration delivery mode, which is highly customized and skills intensive. Marketing when one cannot fill the order is a waste of time. Development in the absence of demonstrable need is also rather questionable.

# Appendixes

A

# Definitions

No industry-specific definitions have been used in this report.

See the separate volume, INPUT's *Definition of Terms*, for the general definitions of industry structure and delivery modes used throughout INPUT reports.

# B

# Forecast Data Base

## A

## Forecast

Exhibit B-1 presents the detailed 1990-1996 forecast for the utilities industry.

EXHIBIT B-1

**Utilities Sector**
**User Expenditure Forecast by Delivery Mode, 1990-1996**
**($ Millions)**

| Delivery Modes | 1990 ($M) | Growth 90-91 (%) | 1991 ($M) | 1992 ($M) | 1993 ($M) | 1994 ($M) | 1995 ($M) | 1996 ($M) | CAGR 91-96 (%) |
|---|---|---|---|---|---|---|---|---|---|
| Sector Total | 1,218 | 9 | 1,330 | 1,486 | 1,662 | 1,857 | 2,079 | 2,330 | 12 |
| *Processing Services* | 201 | 8 | 217 | 248 | 283 | 322 | 367 | 421 | 14 |
| - Transaction Processing | 201 | 8 | 217 | 248 | 283 | 322 | 367 | 421 | 14 |
| *Turnkey Systems* | 85 | 9 | 93 | 105 | 119 | 134 | 152 | 172 | 13 |
| *Applications Software* | 180 | 12 | 202 | 227 | 255 | 287 | 325 | 366 | 13 |
| - Mainframe | 42 | 10 | 46 | 50 | 53 | 56 | 60 | 64 | 7 |
| - Minicomputer | 59 | 10 | 65 | 71 | 78 | 86 | 95 | 102 | 9 |
| - Workstation/PC | 79 | 15 | 91 | 106 | 124 | 145 | 170 | 200 | 17 |
| *Systems Operations* | 25 | 14 | 29 | 32 | 38 | 43 | 48 | 55 | 14 |
| *Systems Integration* | 469 | 9 | 512 | 575 | 646 | 725 | 814 | 914 | 12 |
| *Professional Services* | 233 | 7 | 249 | 268 | 288 | 310 | 334 | 359 | 8 |
| *Network Services* | 25 | 11 | 28 | 31 | 33 | 36 | 39 | 43 | 9 |

# B

## Data Base Reconciliation

Exhibit B-2 presents the forecast reconciliation for the utilities sector.

EXHIBIT B-2

### Utilities Sector
### 1991 MAP Data Base Reconciliation

| Delivery Modes | 1990 Market | | | | 1995 Market | | | | 90-95 CAGR per data 90 rpt (%) | 90-95 CAGR per data 91 rpt (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1990 Report (Fcst) ($M) | 1991 Report (Actual) ($M) | Variance from 1990 Report ($M) | Variance from 1990 Report (%) | 1990 Report (Fcst) ($M) | 1991 Report (Fcst) ($M) | Variance from 1990 Report ($M) | Variance from 1990 Report (%) | | |
| Total | 1,243 | 1,218 | -24 | -2 | 2,248 | 2,079 | -169 | -8 | 13 | 12 |
| Processing Services | 201 | 201 | - | - | 333 | 367 | 34 | 10 | 11 | 14 |
| Turnkey Systems | 85 | 85 | - | - | 145 | 152 | 7 | 5 | 11 | 12 |
| Applications Software | 185 | 180 | -5 | -3 | 333 | 325 | -8 | -2 | 12 | 13 |
| Systems Operations | 45 | 25 | -20 | -44 | 90 | 48 | -42 | -47 | 16 | 19 |
| Systems Integration | 469 | 469 | - | - | 922 | 814 | -108 | -12 | 14 | 12 |
| Professional Services | 233 | 233 | - | - | 386 | 334 | -52 | -13 | 11 | 8 |
| Network Services | 25 | 25 | - | - | 39 | 39 | - | - | 8 | 9 |

There is very little difference in the market size as forecasted for the utilities sector for 1991 and INPUT's final assessment for 1990.

The only significant difference is in the systems operations segment, where the market size has been reduced from $45 million in 1990 to $25 million in 1991.

Overall, the five-year growth rate for utilities is only slightly lower, at a 12% CAGR. This is the result of forecasted growth in systems operations, processing services and applications software products, and slower growth in systems integration and professional services.

# About INPUT

INPUT provides planning information, analysis, and recommendations for the information technology industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions.

Subscription services, proprietary research/consulting, merger/acquisition assistance, and multiclient studies are provided to users and vendors of information systems and services. INPUT specializes in the software and services industry which includes software products, systems operations, processing services, network services, systems integration, professional services, turnkey systems, and customer services. Particular areas of expertise include CASE analysis, information systems planning, and outsourcing.

Many of INPUT's professional staff members have more than 20 years' experience in their areas of specialization. Most have held senior management positions in operations, marketing, or planning. This expertise enables INPUT to supply practical solutions to complex business problems.

Formed as a privately held corporation in 1974, INPUT has become a leading international research and consulting firm. Clients include more than 100 of the world's largest and most technically advanced companies.

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